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EXTENDABLE BUMPERS FOR VEHICLES**CROSS-REFERENCE TO RELATED APPLICATIONS**

This application claims the benefit of U.S. Provisional Application No. 62/256,766, filed on Nov. 18, 2015, the content of which is hereby incorporated by reference in its entirety for all purposes.

TECHNICAL FIELD

The disclosure relates generally to the field of vehicle body structures.

BACKGROUND

In the automotive field, bumpers are vehicle structures that are typically positioned at the front and rear of the vehicle. Functions performed by bumpers include reducing the extent of pedestrian injuries by providing a soft initial contact, absorbing impact to prevent damage to other portions of the vehicle during a low-speed collision, and reducing the extent of height mismatch between vehicles of different sizes.

Bumpers often protrude longitudinally forward with respect to other vehicle structures such as body panels, or longitudinally rearward of other vehicle structures. In the event of a collision at the front or rear of a vehicle, the bumper is often the first part of the vehicle that is struck.

A number of vehicle bumper structures have been utilized. A simple design includes a laterally extending metal beam that is supported forward of other vehicle structures by two or more support structures. Many modern designs include a plastic bumper cover that conceals an underlying bumper structure that is designed to absorb impact by crushing, such as a cellular structure formed from plastic.

SUMMARY

One aspect of the disclosure is a vehicle that includes a body portion, an opening defined by the body portion, and an extendable bumper that is positioned in the opening and is moveable with respect to the body portions between an extended position and a retracted position. The extendable bumper includes an inflatable structure that causes movement of the extendable bumper between the retracted position and the extended position in response to inflation and deflation of the inflatable structure.

Another aspect of the disclosure is a vehicle that includes a vehicle structure and an extendable bumper that includes one or more pivoting structures that are pivotally moveable relatively to the vehicle structure between an extended position and a retracted position.

Another aspect of the disclosure is a vehicle that includes a body portion, an opening defined by the body portion, and an extendable bumper that is positioned in the opening and is moveable with respect to the body portion between an extended position and a retracted position. The extendable bumper is disposed forward relative to the body portion in the extended position and the extendable bumper is at least one of disposed in alignment with the body portion or disposed rearward of the body portion in the retracted position.

Another aspect of the disclosure is a vehicle that includes a body portion and a moveable panel that is moveable between a retracted position and an extended position,

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wherein the moveable panel is adjacent to a lower surface of the body portion in the retracted position and the moveable panel is adjacent to a front surface of the body portion in the extended position.

BRIEF DESCRIPTION OF THE DRAWINGS

The detailed description makes reference to the accompanying drawings, wherein like reference numerals refer to like parts through several views.

FIG. 1 is a side view illustration showing a portion of a vehicle including an extendable bumper system according to a first example in a retracted position.

FIG. 2 is a side view illustration showing a portion of a vehicle including an extendable bumper system according to the first example in an extended position.

FIG. 3 is a side view illustration showing a portion of a vehicle including an extendable bumper system according to a second example in a retracted position.

FIG. 4 is a side view illustration showing a portion of a vehicle including an extendable bumper system according to the second example in an extended position.

FIG. 5 is a side view illustration showing a portion of a vehicle including an extendable bumper system according to a third example in a retracted position.

FIG. 6 is a side view illustration showing a portion of a vehicle including an extendable bumper system according to the third example in an extended position.

FIG. 7 is a side view illustration showing a portion of a vehicle including an extendable bumper system according to a fourth example in an extended position.

FIG. 8 is a side view illustration showing a portion of a vehicle including an extendable bumper system according to a fourth example during impact with an object.

FIG. 9 is a side view illustration showing a portion of a vehicle including an extendable bumper system according to a fifth example in an extended position prior to inflation of a secondary inflatable portion.

FIG. 10 is a side view illustration showing a portion of a vehicle including an extendable bumper system according to a fifth example subsequent to inflation of the secondary inflatable portion.

FIG. 11 is a side view illustration showing a portion of a vehicle including an extendable bumper system according to a sixth example in a retracted position.

FIG. 12 is a side view illustration showing a portion of a vehicle including an extendable bumper system according to the sixth example in an extended position.

FIG. 13 is a side view illustration showing a portion of a vehicle including an extendable bumper system according to a seventh example in an extended position.

FIG. 14 is a top view illustration showing a portion of a vehicle including an extendable bumper system according to an eighth example in a retracted position.

FIG. 15 is a top view illustration showing a portion of a vehicle including an extendable bumper system according to the eighth example in an extended position.

FIG. 16 is a top view illustration showing a portion of a vehicle including an extendable bumper system according to a ninth example in a retracted position.

FIG. 17 is a top view illustration showing a portion of a vehicle including an extendable bumper system according to the ninth example in an extended position.

FIG. 18 is a side view illustration showing a portion of a vehicle including an extendable bumper system according to a tenth example in a retracted position.